WHAT IS CLAIMED IS:

1. A transmission apparatus for applying predetermined processing to and then transmitting extended-cells, comprising:

a receiver for receiving a frame signal from a transmission path;

a demultiplexing/demapping unit for demultiplexing and demapping extended-cells from a payload of the frame signal received from the transmission path;

a cell synchronizer for executing cell synchronization processing to identify an extended-cell boundary;

a controller for subjecting an extended-cell to switching and other control;

a multiplexing/mapping unit for multiplexing and mapping an extended-cell, which is output from said controller, onto a payload of a frame signal; and

a transmitter for transmitting this frame signal to a transmission path.

2. The apparatus according to claim 1, wherein the extended-cell is a variable-length ATM cell, cell length of which is fixed at a cell length that is optimum for storing an IP packet in a payload of the variable-length ATM cell, and processing is limited to two types, namely processing of fixed-length ATM cells and processing of the variable-length ATM cells.

3. A communication network, comprising:

an extended-cell communication network for

transmitting extended-cells in which fixed-length and variable-length cells are mixed or extended-cells in which the formats of fixed-length cells and variable-length cells are unified;

a fixed-length-cell communication network for transmitting fixed-length cells; and

a conversion unit for connecting between the extended cell communication network and the fixed-length-cell communication network, allowing fixed-length cells to pass through both networks and converting variable-length cells to fixed-length cells and sending the fixed-length cells to the fixed-length-cell communication network, or a conversion unit for converting between extended-cells and fixed-length cells and sending the resulting cells to a prescribed network.

4. An SDH transmission apparatus for sending and receiving a virtual container, which is obtained by gathering data from a low-speed side, upon mapping the virtual container onto a payload of a transmit-frame signal, comprising:

SOH terminating equipment for inserting/separating a section overhead of a transmit-frame signal and performing a conversion between a virtual container and the transmit-frame signal;

POH terminating equipment for inserting/separating a path overhead POH of a virtual container and implementing synchronous operation of the virtual container by stuff processing of the virtual container;

a high-speed terminal interface or extended ATM interface for interfacing a high-speed terminal or extended ATM apparatus; and

a selector for selecting data from the low-speed side and data from the high-speed terminal or extended ATM apparatus and inputting the selected data to the POH terminating equipment.

5. A transmission apparatus of an extended-cell communication network for performing communication between a first transmission apparatus (node) and a second node via a working route using extended-cells and performing communication via a bypass route when a failure occurs, comprising:

a first VPI conversion table for converting a VPI of an extended-cell, which enters when communication is normal, to a VPI for a working virtual path;

a second VPI conversion table for converting a VPI of an extended-cell, which enters when the network develops a failure, to a VPI for a bypass virtual path;

a conversion table creation unit for creating said first and second VPI conversion tables;

conversion table distribution means for reorganizing said first and second VPI conversion tables node by node and distributing the reorganized first and second VPI conversion tables to each of the nodes; and

means for setting up one bypass-route monitoring control virtual path for each bypass route and sending a monitor cell to each bypass route via the bypass-route

monitoring control virtual paths.

6. The apparatus according to claim 5, wherein said first and second nodes are connected by a working route and a plurality of bypass routes each of which includes intermediate nodes;

a link forming a route that connects each of the nodes accommodates a plurality of virtual paths; and

each virtual path is classified into a working virtual path, a bypass-route monitoring control virtual path and a bypass virtual path.

7. The apparatus according to claim 6, wherein said first VPI conversion table includes a VPI conversion table for converting a VPI, which has entered via the bypass-route monitoring control virtual path, to a VPI for the bypass-route monitoring control virtual path.

8. An extended-cell communication network for performing communication between a first transmission apparatus (node) and a second node via a working route using extended-cells in which fixed-length and variable-length cells are mixed and performing communication via a bypass route when a failure occurs, wherein:

each node has a first VPI conversion table for converting a VPI of an extended-cell, which enters when communication is normal, to a VPI for a working virtual path; a second VPI conversion table for converting a VPI of an extended-cell, which enters when the network develops a failure, to a VPI for a bypass virtual path; and means for setting up one bypass-route monitoring

control virtual path for each bypass route and sending a monitor cell to each bypass route via the bypass-route monitoring control virtual paths;

said first and second nodes are connected by a working route and a plurality of bypass routes each of which includes intermediate nodes;

if a failure occurs in the working route, said second node detects the failure and sends an alarm to said first node;

said first node, which has received the alarm, sends each of the bypass-route monitoring control virtual paths a changeover command cell for instructing each intermediate node to change over a conversion table from said first VPI conversion table to said second VPI conversion table; and

said first node and said intermediate nodes, the latter of which have received the changeover command, change over a conversion table used from said first VPI conversion table to said second VPI conversion table, convert a VPI of an entered extended ATM cell in accordance with said second VPI conversion table and transmit this extended ATM cell to said second node via a bypass virtual path of said bypass route.

9. The network according to claim 8, wherein a link connecting each of the nodes accommodates a plurality of virtual paths each of which is classified into a working virtual path, a bypass-route monitoring control virtual path and a bypass virtual path;

when a node has detected the changeover command cell from a plurality of bypass-route monitoring control virtual paths accommodated in a link constructing said bypass route, said node reports simultaneous failure to all nodes downstream of said node and to an operating system; and

upon being notified of the simultaneous failure, the operating system arbitrates contention involving simultaneous failure and re-establishes a bypass route.

10. The network according to claim 9, wherein if the working route recovers from failure, a VPI conversion table restore command transmitted from the operating system is received by a prescribed node, said node transmits the changeover command cell to said bypass-route monitoring control virtual path based upon the restore command, and said intermediate nodes change over the conversion table used from said second VPI conversion table to said first VPI conversion table in response to receipt of the changeover command cell.

11. The network according to claim 8, wherein if one of said intermediate nodes detects an abnormality in a bypass route that includes this intermediate node at the time of normal communication, all downstream nodes and the operating system are notified of the abnormality.

12. The network according to claim 8, wherein said second node transmits a bypass-route monitor cell periodically and said first node transmits the VPI conversion table changeover command cell periodically

when a failure occurs.

13. An add/drop multiplexing apparatus for extracting a signal of a low-order communication network from a signal received from a high-order transmission path, inserting a signal that enters from the low-order communication network and sending the signal to the high-order transmission path, comprising:

a receiver for receiving a frame signal from the high-order transmission path;

a cross-connect unit for cross connecting a signal, which has been mapped onto a payload of the frame signal received by said receiver, and extracting a prescribed signal having a first format;

a tributary interface for converting the signal, which has been extracted by said cross-connect unit, to a signal having a second format that corresponds to the low-order communication network; and

a transmitter for mapping a signal, which has been cross connected by said cross-connect unit, onto a payload of a frame signal and sending this frame signal to the high-order transmission path;

wherein said tributary interface converts an extended-cell, which has been received from the low-order communication network, to a signal having the first format capable of being processed by said cross-connect unit, converts a signal, which has been output from said cross-connect unit, to an extended-cell as said signal having the second format and sends the

extended-cell to the low-order communication network.

14. The apparatus according to claim 13, wherein said tributary interface includes:

a VC table in which an identifier of a virtual channel being used by the low-order communication network is registered;

signal terminating equipment for converting a signal, which has been output from said cross-connect unit, to an extended-cell;

a routing-tag assembling unit for extracting a virtual-channel identifier from a header of the extended-cell output from said signal terminating equipment, comparing the extracted virtual-channel identifier and the virtual-channel identifier that has been registered in said VC table, and if the two virtual-channel identifiers match, adding a routing tag, which indicates that the low-order communication network is the destination, onto the extended-cell; and

a routing device for referring to a routing tag of an extended-cell that has been output from said routing-tag assembling unit, determining whether the destination of this extended-cell is the low-order communication network, transferring this extended-cell to the low-order communication network if the destination of the extended-cell is the low-order communication network, and sending this extended-cell back to the routing-tag assembling unit if the destination of the extended-cell is not the low-order communication network; and

a routing-tag disassembling unit for removing a routing tag from an extended-cell that is transmitted from said routing device to the low-order communication network.

15. The apparatus according to claim 14, wherein when an extended-cell is sent back from said routing device, said routing tag assembling unit removes a routing tag from this extended-cell and sends the extended-cell from which the routing tag has been removed back to said cross-connect unit.

16. The apparatus according to claim 14, wherein in a case where a communication network is constructed by connecting a plurality of add/drop multiplexing apparatus in ring form by a working transmission path and a protection transmission path, said tributary interface has first and second signal terminating equipments for the working and protection transmission paths as said signal terminating equipment, and first and second routing-tag assembling units for the working and protection transmission paths as said routing-tag assembling unit;

when an extended-cell, which indicates that the low-order communication network is the destination, has entered from said first signal terminating equipment of the working transmission path, said first routing-tag assembling unit for the working transmission path adds a routing tag, which indicates that the low-order communication network is the destination, onto the

extended-cell;

when an extended-cell, which indicates that the low-order communication network is the destination, has entered from said second signal terminating equipment of the protection transmission path, said second routing-tag assembling unit for the protection transmission path adds a routing tag, which indicates that this extended-cell is to be discarded, onto the extended-cell; and

said routing device transfers an extended ATM cell, which has entered from said first routing-tag assembling unit of the working transmission path, to the low-order communication network and discards an extended ATM cell that has entered from said second routing-tag assembling unit of the protection transmission path.

17. The apparatus according to claim 16, wherein said tributary interface has a ring topology map for holding topology information indicating the topology of add/drop multiplexing apparatus that construct the ring-shaped communication network.

18. The apparatus according to claim 17, wherein said tributary interface has a switch map for holding, in association with apparatus identification information identifying each add/drop multiplexing apparatus that constructs the ring-shaped communication network, transmission-path changeover information indicating whether it is necessary to switch between working and protection channels when a failure occurs in an add/drop multiplexing apparatus.

19. The apparatus according to claim 16, wherein said tributary interface has:

a ring topology map for holding topology information indicating the topology of add/drop multiplexing apparatus that construct the ring-shaped communication network;

a switch map for holding, in association with apparatus identification information identifying each add/drop multiplexing apparatus that constructs the ring-shaped communication network, transmission-path changeover information indicating whether it is necessary to switch between working and protection channels when a failure occurs in an add/drop multiplexing apparatus;

a failure detector for judging that a failure has occurred in a neighboring upstream add/drop multiplexing apparatus by referring to said ring topology map when non-synchronization of a received extended-cell is detected;

a failure-occurrence notification unit for transmitting an OAM cell, in which has been recorded apparatus identification information specifying an upstream add/drop multiplexing apparatus, over said communication network when a failure has been detected by said failure detector; and

a transmission-path changeover unit which, when an OAM cell transmitted from another add/drop multiplexing apparatus has been received, is for extracting apparatus

identification information from this OAM cell, searching said switch map based upon this apparatus identification information and, if a result of the search indicates that it is necessary to switch between the working and protection channels, interchanging content of the routing tag assembled by said first routing-tag assembling unit for the working transmission path and content of the routing tag assembled by said second routing-tag assembling unit for the protection transmission path.